

Layers within Valles Marineris:  
Clues to the Ancient Crust of Mars  
(P-49611)

This high-resolution picture of the Martian surface was obtained in the early evening of January 1, 1998, by the Mars Orbiter Camera shortly after Mars Global Surveyor began its 80th orbit. Seen in this view are a plateau and surrounding steep slopes within Valles Marineris, a large system of canyons that stretches 4,000 kilometers (2,500 miles) along the equator.

The image covers a tiny fraction of the canyons at very high resolution: It extends only 9.8 by 17.3 kilometers (6.1 by 10.7 miles), but captures features as small as 6 meters (20 feet) across. The highest terrain in the image is the relatively smooth plateau near the center. Slopes descend to the north and south (upper and lower part of image, respectively) in broad, debris-filled gullies with intervening rocky spurs.

Multiple rock layers, varying from a few meters to a few tens of meters thick, are visible in the steep slopes on the spurs and gullies. Layered rocks on Earth form from sedimentary processes, such as those that formed the layered rocks in Arizona's Grand Canyon, and volcanic processes, such as the layering seen in Waimea Canyon on the island of Kauai. Both origins are possible for the layered rocks seen in this image. In either case, the total thickness of the layered rocks seen in this image implies a complex and extremely active early history for geologic processes on Mars.

#### Mission Overview

Mars Global Surveyor was launched on November 7, 1996, and entered a highly elliptical orbit around Mars on September 11, 1997. The original mission plan called for using friction with the planet's atmosphere to reduce the orbit's size, leading to a two-year mapping mission from close circular orbit beginning in March 1998. Owing to difficulties with one of the two solar panels, aerobraking — the process of circularizing the spacecraft's orbit — has been extended to March 1999. Although global mapping will not begin until then, extensive scientific observations of Mars' northern hemisphere will be made from April to September 1998.

Malin Space Science Systems (MSSS) and the California Institute of Technology built the Mars Orbiter Camera using spare hardware from the Mars Observer mission. MSSS operates the camera from its facilities in San Diego, California. The Jet Propulsion Laboratory's Mars Surveyor Operations Project operates the spacecraft with its industrial partner, Lockheed Martin Astronautics, from facilities in Pasadena, California, and Denver, Colorado.

#### The Mars Surveyor Program

Mars Global Surveyor is the first venture in the National Aeronautics and Space Administration's (NASA's) Mars Surveyor Program, a new series of missions to explore the Red Planet. The Mars Surveyor Program will launch orbiters and landers every 25 months over the next decade, using advanced technology to develop a comprehensive portrait of Mars.

By studying Mars, the most likely planet for future human expeditions, scientists hope to better understand the formation and evolution of Earth and the inner solar system. This effort — which is affordable, engaging to the public, and of high scientific value — will infuse science, mathematics, and engineering into our nation's educational system. International participation and collaboration further enhance the value of the Mars Surveyor Program.

The Jet Propulsion Laboratory (JPL), a division of the California Institute of Technology, manages Mars Global Surveyor and the Mars Surveyor Program for NASA's Office of Space Science. JPL, NASA's lead center for automated space exploration, provides mission design and navigation, and manages mission operations.

A 34-meter antenna subnetwork of NASA's Deep Space Network tracks and acquires data from all the Mars spacecraft. Lockheed Martin Astronautics is the industrial partner for the Surveyor program.



National Aeronautics and  
Space Administration

Jet Propulsion Laboratory  
California Institute of Technology  
Pasadena, California

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